NO-TILL SUMMERFALLOW

By E. Reimer

Tillage has been a common practice ever since man began growing food to feed himself and his family. The economics of tillage, over the last decade, has been such that growers are investigating alternative techniques. Increased cost of machinery, labour, and fuel have been the most significant causes for this economic imbalance. Presently, growers are looking at a substitute for tillage, namely "chemical farming", as a relief for their high cost of tillage, especially in a summerfallow year.

Since 1967, Chipman Chemicals Limited, has researched and developed this aspect of "chemical farming". In this innovation, chemicals are substituted for tillage and the results have proven that this can be done both effectively and economically. The end result of this program is that no tillage takes place in the summerfallow year. This concept of leaving a field in stubble throughout the year, with only tractor and sprayer tracks visible in the field has been a major stumbling-block to most growers. Traditionally, fields are "black" in summerfallow rotations and this idea of leaving stubble on the field throughout the year has only recently been accepted.

Tillage is primarily used for trash and weed control, moisture conservation, and seedbed preparation. It has now been shown that tillage alone, is not sufficient to attain the aforementioned benefits of summerfallowing. Tillage usually destroys all trash cover, leaving the soil exposed to wind and water erosion. It also destroys soil structure, thereby actually drying out the soil and hence reducing the soil's water-holding capacity. As for weed control, one only has to drive around in the country in July and August to see the "green" summerfallow fields. Growers have stated that they feel they are not gaining on weed control in their summerfallow with tillage. Most growers do not have the time to keep weeds at a minimum on summerfallow fields or if they do have the time many weeds are transplanted with their tillage techniques. Seedbed preparation is probably a minor reason for tillage in summerfallow, but nevertheless, it is an operation that is traditionally carried out.

This innovation of "chemical farming" termed "NO-TILL" by Chipman Chemicals Limited can and will give an alternative to tillage at an economical return to the growers. Presently, chemicals are available which can be readily substituted for tillage and afford the grower satisfactory weed control. Chipman Chemicals Limited concur that a grower first has to get acquainted with standing stubble and the proper application of chemicals before he can adapt to this concept of NO-TILL on a large scale. This is one of the reasons that Chipman Chemicals Limited introduced the NO-TILL summerfallow on a hand-to-hand basis in 1977. They also maintain that after the season of 1978, when growers have had an opportunity to compare the NO-TILL summerfallow, the grower will then be prepared to make NO-TILL a part of his farming operation.

There are many reasons for a grower to change from the conventional tillage to NO-TILL. The following are a few of the major benefits of NO-TILL summerfallow:

Wind and Water Erosion: Each year there are countless acres of land which are subject to erosion by wind or water. In wind erosion, movement of soil can be very drastic, as literally tons of soil can be lost per acre. Tillage usually does not maintain adequate trash cover to prevent this loss. NO-TILL leaves crop residues at the soil surface and lessens the disturbance of soil particles in land preparation. Residues from previous crops reduces surface wind velocity and prevents contact of the wind with the soil, thus reducing rapid loss of soil moisture, which in turn reduces wind erosion. Standing stubble is particularily advantageous for reducing water erosion. The root systems bind the soil particles together, thereby reducing the effect of the water erosion.

Soil moisture, compaction, and temperature: Soil moisture normally is lost from the root zones by evaporation, runoff of surface water, transpiration by growing plants, and percolation (i.e. movement of water down into the soil) to a depth beyond the root zone. Soil covered with crop residues normally will hold more moisture at saturation than the same soil after tillage. Plant roots promote larger pore spaces, therefore allowing the soil to retain larger amounts of water. Tillage tends to destroy plant roots and openings created by the roots, thereby reducing the soil's moisture-holding capacity. The use of bigger, heavier, and more powerful farm machinery is increasing soil compaction problems. This produces a compacted layer whereby plant roots and moisture can not penetrate, resulting in crop losses. Under NO-TILL, less machinery is required and the opportunity for these layers to develop is eliminated. Crop residues can help maintain soil temperatures. Soils warm up during the day, and cool off at night. Crop residue tends to maintain a more even temperature in the day-night fluctuations.

Weed Control: Herbicides in NO-TILL summerfallow must perform the functions of tillage. Conventionally, tillage occurs when weeds are at a certain stage at which the grower feels cultivation is necessary. Tillage not only brings new weed seeds to the soil surface, but also increases the number of weed seeds that will germinate. If weed seeds are left undisturbed, the number that will germinate is greatly reduced. Under NO-TILL, very few weed seeds are disturbed and as a result weed infestations in the summerfallow are reduced. Applications of suitable herbicides are necessary under NO-TILL but the timing of these applications are more critical than under conventional tillage practices. If weeds are allowed to grow beyond the seedling stage, soil moisture can be depleted.

Positive Steps in NO-TILL Summerfallow: As with any new and innovative method, certain procedures have to be followed to ensure acceptable success in NO-TILL summerfallow. The procedures consist of (a) Trash management and (b) Weed Control. (a) Trash management is very critical under NO-TILL farming. After harvesting, the straw (wind row) has to be either chopped

and spread or removed from the field. If the wind row is left lying on the field, the trash will cover weeds and, at the time of the herbicide application, the spray will not be able to penetrate the residue. Under light crop conditions, spreading and chopping would probably be sufficient; but under heavy cropping, baling the straw is recommended.

(b) Weed control, as mentioned previously, is more critical under NO-TILL summerfallow than under conventional systems. Winter annuals are a problem in most areas and therefore a fall application of a hormone type herbicide (2, 4-D, or MCPA) is recommended. Control of these weeds in the fall is relatively easy and allows for later spraying in the following spring for normal weed control. In the spring, application of herbicides vary according to weed populations. Annual grasses, such as wild oats and volunteer grains, can be readily controlled by a contact herbicide such as paraquat or glyhosate. If annual bradleaf weeds are present, they can be treated with a hormone type spray such as 2, 4-D, or MCPA. When hard-to-control weeds, such as wild buckwheat or smartweed are present, chemicals such as bromoxynil or decamba could be used. Presently, there is no hard and fast rule as to how many applications of herbicides will have to be made throughout the summerfallow year. Weed growth is determined by climatic conditions which are conducive to weed germination. Contact herbicides, such as paraquat and bromoxynil, control only the weeds that are present at the time of spraying and have very little effect in controlling perennial weeds such as Canada thistle. Systemic chemicals, such as glyphosate and dicamba provide adequate annual and perennial weed control. Normally systemic herbicides are applied at a later stage.

Economics of NO-TILL Summerfallow: Very few growers are aware of what their actual costs are for tillage in summerfallow operations. It is a fairly difficult figure to determine, as there are many factors involved. Factors such as machinery costs and depreciation, labour, and fuel vary from farm to farm. Usually, the farm acreage determines the type and size of farm machinery. Taking all the factors into account, the average grower estimates that his cost of tillage per operation per acre is in the range of $2.00 to $2.50. The number of operations for summerfallow also varies from farm to farm. The range is from 3 to 12 operations. The median appears to be in the range of 5 to 7. Assuming the grower carries out 6 operations at a cost of $2.25 per acre per operation, the cost is $13.50 per acre for the summerfallow year. In areas where wind erosion is a problem, there is no easy way of assessing the cost of loss of soil due to tillage. It is in these areas where acceptance of NO-TILL is the highest. The cost of chemicals varies according to the rate used and the number of applications made. Generally speaking, the cost of using chemicals rather than tillage in summerfallow are comparable to tillage costs.

The entire concept of NO-TILL is based on reducing costs of summerfallowing and soil erosion as well as obtaining better weed control and conserving more moisture. NO-TILL does not require the purchase of big and costly machinery,

as only a field sprayer and a small tractor are required. Tillage will still remain as a farming practice for many growers, but for those that have the problems of soil erosion, poor weed control, lack of adequate moisture, and a high cost of tillage, NO-TILL definately provides an economical and beneficial alternative to tillage.

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